



Predicting the effect of climate change on African trypanosomiasis: Integrating epidemiology with parasite and vector biology

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Year: 2011
Journal: Journal of The Royal Society, Interface / The Royal Society

Abstract:

Climate warming over the next century is expected to have a large impact on the interactions between pathogens and their animal and human hosts. Vector-borne diseases are particularly sensitive to warming because temperature changes can alter vector development rates, shift their geographical distribution and alter transmission dynamics. For this reason, African trypanosomiasis (sleeping sickness), a vector-borne disease of humans and animals, was recently identified as one of the 12 infectious diseases likely to spread owing to climate change. We combine a variety of direct effects of temperature on vector ecology, vector biology and vector-parasite interactions via a disease transmission model and extrapolate the potential compounding effects of projected warming on the epidemiology of African trypanosomiasis. The model predicts that epidemics can occur when mean temperatures are between 20.7 degrees C and 26.1 degrees C. Our model does not predict a large-range expansion, but rather a large shift of up to 60 per cent in the geographical extent of the range. The model also predicts that 46-77 million additional people may be at risk of exposure by 2090. Future research could expand our analysis to include other environmental factors that influence tsetse populations and disease transmission such as humidity, as well as changes to human, livestock and wildlife distributions. The modelling approach presented here provides a framework for using the climate-sensitive aspects of vector and pathogen biology to predict changes in disease prevalence and risk owing to climate change.

Source: <http://dx.doi.org/10.1098/rsif.2011.0654>

Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES)

Special Report on Emissions Scenarios (SRES) Scenario: SRES A2, SRES B2

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure :

Climate Change and Human Health Literature Portal



weather or climate related pathway by which climate change affects health

Ecosystem Changes, Temperature

Temperature: Fluctuations

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

Non-United States

Non-United States: Africa

Health Impact:

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Fly-borne Disease

Fly-borne Disease: Trypanosomiasis

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology:

type of model used or methodology development is a focus of resource

Exposure Change Prediction, Outcome Change Prediction

Resource Type:

format or standard characteristic of resource

Research Article

Timescale:

time period studied

Short-Term (

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content

